Unit 4 - Populations and Resources

Content Area: **Science**
Course(s):
Time Period: **Full Year**
Length: **Full Year**
Status: **Published**

Unit Overview

In the role of student ecologists at a research center near the fictional Glacier Sea, students investigate what may have caused a puzzling increase in the size of the moon jelly population there, which serves as the anchor phenomenon for the unit. Using a fictional scenario, based on real jelly increases all over the world, students are motivated to find out more about how the ecosystem is connected, and how changes to one population in the food web might cause changes to another population. Using the Populations and Resources Simulation to gather evidence about how ecosystems work, students learn how different populations affect each other, both directly and indirectly. Students use this newfound knowledge and data from Glacier Sea to determine the most likely cause of the moon jelly population increase as well as engage in scientific argumentation as they model and explain their claim.

Enduring Understandings

Within a population, organisms are always being born and dying. A system can be stable even as things are being added to and removed from it. If the amounts being added and being removed are not equal, then the system will change. If the number of births and deaths in a given time are equal, then the population size will be stable. If there are more births than deaths in a given time, then the size of the population will increase. If there are fewer births than deaths, then the size of the population will decrease.

Organisms need to release energy from energy storage molecules in order to reproduce. Organisms in consumer populations get energy storage molecules from eating organisms in resource populations.
The larger the consumer population, the more energy storage molecules it will need. Therefore, it will eat more, causing more deaths in the resource population.
Two populations can compete for the same resource population. A change to one of these populations affects the size of the other. The size of a population can be affected by any population that is connected to it in a food web, even if they are not directly connected.

Essential Questions

Why do populations change size in an ecosystem?
How do births and deaths in a population affect its size?
What can change the number of births in a population?
What can change the number of deaths in a population?
What can affect the size of a population besides its resource or consumer populations?

Learning Objectives

Within a population organisms are always being born and dying.
A system can be stable even as things are being added to and removed from it. If the amounts being added and being removed are not equal, then the system will change.
If the number of births and deaths in a given time are equal, then the population size will be stable
If there are more births than deaths in a given time, then the size of the population will increase. If there are fewer births than deaths, then the size of the population will decrease.
Organisms need to release energy from energy storage molecules in order to reproduce.
Organisms in consumer populations get energy storage molecules from eating organisms in resource populations.
The more energy storage molecules available to a population, the more the organisms in that population can reproduce.
The larger the resource population, the more energy storage molecules are available for its consumer populations.
The larger the consumer population, the more energy storage molecules it will need. Therefore, it will eat more, causing more deaths in the resource population.
Two populations can compete for the same resource population. A change to one of these populations affects the size of the other.
The size of a population can be affected by any population that is connected to it in a food web, even if they are not directly connected.
Explore the Simulation and read about other populations that are part of the moon jelly ecosystem.
Model births and deaths in a population using tokens and watch a video about stability and change.
Evaluate evidence about the jelly population and create a visual model showing two possible reasons the jelly population may have increased.
Read an article about why organisms need energy in order to reproduce.
Test ways of changing the amount of reproduction and ways of changing the amount of deaths in the Sim.
Create visual models showing possible reasons for the increase in moon jellies.
Evaluate and analyze evidence about other populations in the ecosystem.
Read about two real populations of moon jellies, one that increased and one that remained stable.
Investigate competition and other indirect effects in the Sim.
Evaluate and analyze evidence about different populations in the ecosystem and write final arguments about the cause of the moon jelly increase.
Examine how shifts in populations within an ecosystem effect the climate. (Climate Change)

Standards: Content

SCI.MS-LS1-4	Use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively.
SCI.MS-LS1-5	Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.
SCI.MS-LS2-1	Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.
SCI.MS-LS3-1	Develop and use a model to describe why structural changes to genes (mutations) located on chromosomes may affect proteins and may result in harmful, beneficial, or neutral effects to the structure and function of the organism.
SCI.MS-LS3-2	Develop and use a model to describe why asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic

	variation.
SCI.MS-LS4-5	Gather and synthesize information about the technologies that have changed the way humans influence the inheritance of desired traits in organisms.

Standards: Interdisciplinary

Assessment Evidence

Formative	Teacher observations, Class discussions, Lab Activities, Key concepts and vocabulary quizzes, Warm Ups, Open Ended Responses, Modeling, Simulations, Innovators Monthly Research
Summative	In correlation with the NJSLS, students must demonstrate the following as summative assessments: MS-LS2-1. Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem MS-LS2-2. Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems. MS-LS2-3. Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem. MS-LS2-4. Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations. MS-LS2-5. Evaluate competing design solutions for maintaining biodiversity and ecosystem services. Other summative assessments will include but are not limited to: lesson activities, summative tests, lab skills, demonstrations, and vocabulary quizzes
Alternative & Benchmark	Alternative assessments as required by student IEP/504/I&RS - Read to the student and chart oral responses. Word banks, sentence frames, oral responses, graphic organizers, observations, and anecdotal notes. Benchmark – LinkIt Benchmark Assessment, Teacher Generated Assessments
Assessment Evidence Resource	

Instructional Resources

Smartboard, Computers, Websites and digital interactives/models, Multi-media presentations, Video Streaming, Amplify Digital Curriculum, Generation Genius, BrainPop, Mystery Science, Microsoft 365, Primary and Secondary Source Documents, Lab Materials as needed, Amplify Readings, Labs, Simulations

Instructional Resource List

Curricular Mandates

Below are the curricular requirements as defined in NJ Administrative Code and Statute

	Amistad		Diversity, Equity, and Inclusion
	Holocaust		LGBT and Disabilities (Grades 6-12)
X	Climate Change		Asian American & Pacific Islander

Social Emotional Learning (SEL) Competencies

NJ Social and Emotional Learning Competencies & Sub-Competencies

	Self-Awareness	X	Relationship Skills
X	Responsible Decision-Making	X	Social Awareness
X	Self-Management		

21st Century Skills & Themes

X	Global and Cultural Awareness	X	Technology Literacy		Planning and Budgeting
X	Creativity and Innovation		Financial Institutions		Risk Management and Insurance
X	Information and Media Literacy		Digital Citizenship		Economic and Government Influences
X	Critical Thinking and Problem Solving		Credit Profile		Career Awareness and Planning
	Civic Financial Responsibility		Financial Psychology		